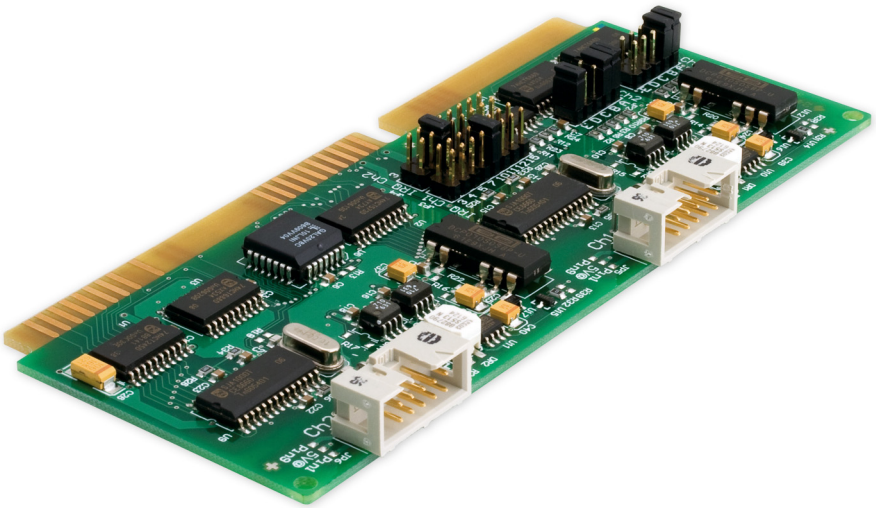
PCAN-ISA

CAN Interface for ISA

User Manual



PEAK System

Products taken into account

Product Name	Model	Item Number
PCAN-ISA Single Channel	One CAN channel	IPEH-002074
PCAN-ISA Dual Channel	Two CAN channels	IPEH-002075
PCAN-ISA Single Channel opto-decoupled	One CAN channel, galvanic isolation for CAN connection	IPEH-002076
PCAN-ISA Dual Channel opto-decoupled	Two CAN channels, galvanic isolation for CAN connections	IPEH-002077

The cover picture shows the product PCAN-ISA Dual Channel opto-decoupled. Other product versions have an identical form factor but vary in equipment.

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Issued 2013-11-18

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1 Introduction

Tip: At the end of this manual (Appendix B) you can find a **Quick Reference** with brief information about the installation and operation of the PCAN-ISA card.

With the PCAN-ISA add-on card for the ISA bus in the computer you can connect one or with the Dual Channel version even two CAN busses. Thus the computer becomes part of a High-speed CAN network (HS-CAN). The applications running on the computer are the CAN nodes.

The registers of a CAN controller can be directly addressed via the I/O addresses of the computer.

With the opto-decoupled versions of the PCAN-ISA card an isolation of up to 500 V between the computer and the CAN parts of the card is achieved by use of a DC/DC converter and an optocoupler.

Note: This manual refers to different versions of the PCAN-ISA card (see also *Products taken into account* on page 2). Differences at use and at the technical specifications are mentioned accordingly in this manual.

1.1 Properties at a Glance

- Extension card for ISA slot (16 bit) in the computer
- Support of interrupts IRQ3 – IRQ5, IRQ7, IRQ10 – IRQ12, IRQ15 (manual setup with jumpers)
- Shared interrupt possible for use with several cards or the Dual Channel version in a computer

- Connection of a High-speed CAN bus (two with the Dual Channel version), CAN specifications 2.0A and 2.0B
- Equipped with one or two CAN controllers SJA100T by Philips/NXP (independently configurable)
- CAN connection 9-pin D-Sub male, pin assignment according to CiA recommendation DS 102
- CAN transfer rate up to 1 MBit/s
- Galvanic isolation up to 500 V for the CAN interface (only opto-decoupled versions)
- Support for operating systems Windows (starting with 2000) and Linux

Note: This manual describes the use of the PCAN-ISA card with Windows. You can find device drivers for Linux and the corresponding information on PEAK-System's website under www.peak-system.com/linux.

1.2 System Requirements

The following prerequisites must be given, so that the PCAN-ISA card can be used properly:

- An empty ISA slot (16 bit) in the computer
- Operating system Windows (Vista, XP SP2, 2000 SP4) or Linux

1.3 Scope of Supply

The scope of supply normally consists of the following parts:

- PCAN-ISA card
- Slot bracket with one or two CAN D-Sub connectors including cables to the PCAN-ISA card
- CD-ROM with software (drivers, utilities), programming examples, and documentation

2 Hardware Installation

2.1 Configuring the PCAN-ISA Card

Before you install the PCAN-ISA card into the computer you may need to configure it. For each CAN channel an interrupt (IRQ) and an I/O address range is set for operation in the computer.

At delivery the PCAN-ISA card has the following default settings:

CAN Channel	IRQ	I/O Address Range	Remark
1	10	300h – 31Fh	
2	5	320h – 33Fh	Only on the Dual Channel version

Tip: If the given resources are not firmly occupied by other devices, you can skip the configuration and directly continue with the following manual section 2.2.

For a configuration differing from the default settings you need to set jumpers on the PCAN-ISA PCB according to the following explanations.

Position of the Jumper Fields on the PCAN-ISA Card

The single-channel version of the PCAN-ISA card has two jumper fields, one for the setting of the I/O address range and one for the setting of the interrupt (Figure 1). Accordingly the Dual Channel version has the doubled layout (Figure 2).

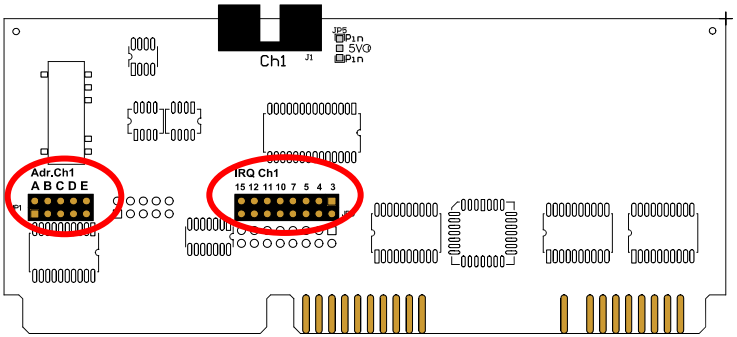

Figure 1: PCAN-ISA Single Channel – Position of the jumper fields for setting the I/O address range (JP1, left marker) and the interrupt (JP3, right marker)

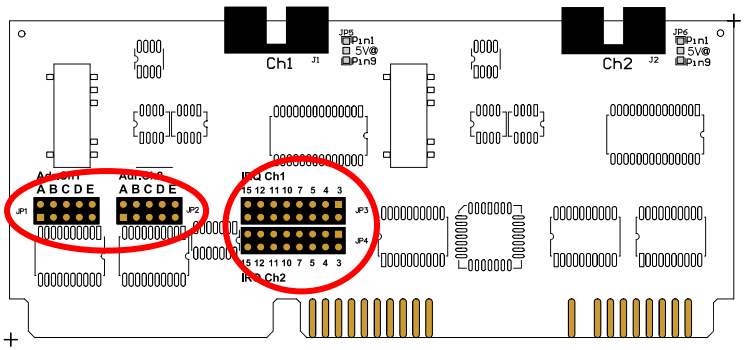

Figure 2: PCAN-ISA Dual Channel – Position of the jumper fields for setting the I/O address ranges (JP1, JP2, left marker) and the interrupts (JP3, JP4, right marker)

I/O Address Range

Each CAN channel must be assigned to an unique I/O address range in the computer. An address space from 200h up to 39Fh (h = hexadecimal) is available. The PCAN-ISA card uses 32 addresses beginning from the configured base address. The configuration is done on jumper field JP1 for CAN channel 1 and jumper field JP2 for CAN channel 2 (latter only with the Dual Channel version).

The following table shows the possible settings. The X stands for a set jumper. The default settings at delivery for CAN channels 1 and 2 are highlighted.

Jumper field JP1/JP2					I/O address range
A	B	C	D	E	
X					200h – 21Fh
X				X	220h – 23Fh
X			X		240h – 25Fh
X			X	X	260h – 27Fh
X		X			280h – 29Fh
X		X		X	2A0h – 2BFh
X		X	X		2C0h – 2DFh
X		X	X	X	2E0h – 2FFh
X	X				300h – 31Fh
X	X			X	320h – 33Fh
X	X		X		340h – 35Fh
X	X		X	X	360h – 37Fh
X	X	X			380h – 39Fh

Interrupt

An interrupt (IRQ) must be assigned to each CAN channel. The PCAN-ISA card supports the interrupts 3, 4, 5, 7, 10, 11, 12, and 15. The default setting at delivery for CAN channel 1 is interrupt 10, for CAN channel 2 interrupt 5.

It is possible to share the same interrupt between two existing CAN channels. Therefore you can configure the same interrupt, when using two PCAN-ISA cards in the same computer.

Tip: We suggest to configure different interrupts as long as resources allow it and use interrupt sharing only, if this is not the case.

2.2 Installation into the Computer

Do the following to install the PCAN-ISA card into the computer:

1. Make sure that the computer is turned off (power switch at the computer's supply unit).
2. Open the casing and plug the PCAN-ISA card into an empty slot on the computer's motherboard. For details please refer to the documentation of the computer.
3. In the computer replace a slot bracket with the supplied slot bracket containing the D-Sub connector(s) for the CAN bus, if applicable.
4. For each CAN channel connect the flat cable to the corresponding connector on the PCAN-ISA card.

   You can look up the pin assignment of the 10-pin CAN connectors on the card in section 0 on page 11.

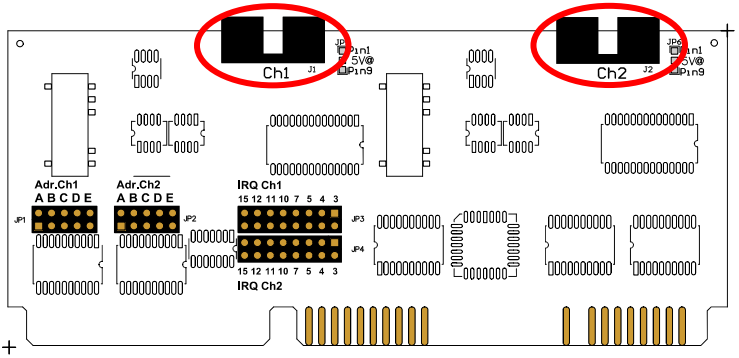

Figure 3: Connectors for the cable(s) to the slot bracket (here: PCAN-ISA Dual Channel, the single-channel version only has the left connector Ch1)

5. Close the computer's casing.

Note: Before switching on the computer, please follow the procedure for modifying the computer's BIOS settings described in the following section.

2.3 Modifying the Computer's BIOS Settings

To ensure a flawless operation of the PCAN-PC/104 card it is necessary that you adjust settings in the BIOS setup of the computer:

- Indicate used interrupts
- Deactivate the APIC mode

Note: Due to a diversity of existing BIOS setup versions for computers we cannot give detailed instructions here. Instead we indicate common setting names.

In order to know how to start the computer's BIOS setup please consult the corresponding documentation. Usually you can enter the BIOS setup by pressing the Del or F2 key shortly after switching on the computer.

2.3.1 Indicating Used Interrupts

By indicating the interrupts that are set on the PCAN-PC/104 card, you avoid that the corresponding resources are automatically assigned to other devices and that this results in conflicts.

In the BIOS setup itself you can often find the settings for the interrupts under a menu item containing the text “PnP”. For the interrupt(s) used by PCAN-PC/104 change the setting to “Reserved” or “Legacy ISA”.

2.3.2 Deactivating the APIC Mode

Note: Do not mix up APIC with ACPI.

The APIC mode is a certain type of interrupt management in a computer.

If the APIC mode is active in your computer, you must deactivate it so that the PCAN-PC/104 card can work properly with interrupts.

- Do the following to determine in Windows if the APIC mode is active:

  1. Open the Windows **Device Manager**.
  2. Select the menu entry **View** > **Resources by type**.
  3. Open the branch of **Interrupt request (IRQ)**.

     If entries with interrupt numbers greater than 15 are listed, the APIC mode is active and you must deactivate it.

- Do the following to deactivate the APIC mode:

Important note: When you deactivate the APIC mode in the BIOS setup, it may happen that you must reinstall Windows afterwards, because it cannot start anymore due to the low-level setting.

1. Restart the computer and switch to the BIOS setup.
2. Search for the APIC setting and deactivate it.
3. Save the changes in the BIOS and quit the BIOS setup.
4. If Windows doesn't start properly, reinstall it or perform a repair installation.

2.4 Connecting a CAN Bus

A High-speed CAN bus (ISO 11898-2) is connected to one of the 9-pin D-Sub ports on the slot bracket. The pin assignment corresponds to the CiA recommendation DS 102-1.

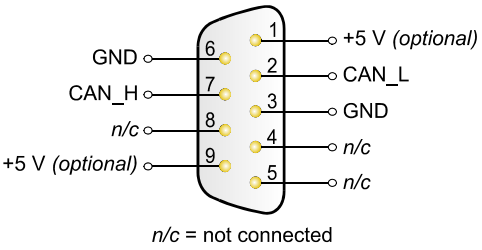

Figure 4: Pin assignment HS-CAN
(view onto connector of the slot bracket)

The pin assignment between the D-Sub port and the 10-pin connector on the PCAN-ISA card is as follows:

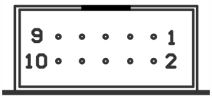

Figure 5: Numbering at the 10-pin connector

Pin	Assignment	Assignment D-Sub
1	+5 V (optional)	1
2	GND	6
3	CAN_L	2
4	CAN_H	7
5	GND	3
6	not connected	8
7	not connected	4
8	+5 V (optional)	9
9	not connected	5
10	not connected	

2.5 5-Volt Supply at the CAN Connector

You can route a 5-Volt supply to pin 1 and/or pin 9 of the CAN connector (independently for each CAN connector on the Dual Channel version) by setting solder bridges on the PCAN-ISA card. Thus devices with low power consumption (external transceivers or optocouplers, for example) can be directly supplied via the CAN connector.

When using this option the 5-Volt supply is connected to the power supply of the computer and is not fused separately. The opto-decoupled versions of the card contain an interconnected DC/DC converter. Therefore the current output is limited to about 50 mA.

Attention! At this procedure special care is indispensable, since there is a short circuit danger. The PCAN-ISA card could be destroyed and/or the power supply or electronics of the computer or other components connected could be damaged.

Attention! Risk of short circuit! If the option described in this section is activated, you may only connect or disconnect CAN cables or peripheral systems (e.g. external transceivers or optocouplers) to or from the PCAN-ISA card while the computer is de-energized.

Important note: PEAK-System Technik GmbH does not give guarantee on damages which have resulted from application of the option described in this section.

Set the solder bridge(s) on the card according to the desired settings. Figure 6 shows the positions on the card; the table below contains the possible settings.

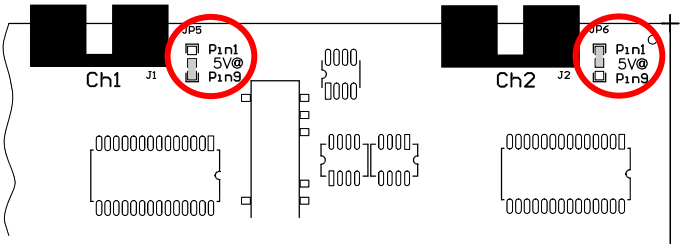

Figure 6: Position of the solder bridge fields for the 5-Volt supply

5-Volt supply →	**None**	**Pin 1**	**Pin 9**	**Pin 1 + Pin 9**
JP5 (CAN channel 1) / JP6 (CAN channel 2)				

3 Software Setup

Under Windows a driver is needed that can access the PCAN-ISA card and that provides the interface for Windows applications. Beside the mentioned device driver the CAN monitor PCAN-View for Windows can also set up.

Do the following to setup the driver and, if applicable, additional software:

1. Please make sure that you are logged in as user with administrator privileges (not needed for normal use of the PCAN-ISA card later on).
2. Insert the supplied CD-ROM into a drive of the computer. Usually a navigation program appears a few moments later. If not, start the file `Intro.exe` from the root directory of the CD-ROM.
3. Navigate through the menus to the driver installation for the PCAN-ISA card (**English** > **Drivers** > **PCAN-ISA**). Click on **Install now** afterwards. The setup program for the driver is executed. Under Windows Vista you may need to confirm the note about the execution with elevated rights.
4. Follow the instructions of the setup program.

4 Software

This chapter deals with the provided software and the software interface to the PCAN-ISA card.

4.1 PCAN-View for Windows

PCAN-View for Windows is a simple CAN monitor for viewing and transmitting CAN messages.

Installation

You can install the application optionally during the driver setup procedure (see also chapter 3 *Software Setup* on page 16).

Program Start

In the Start menu of the Windows desktop you can find the entry "PCAN Hardware". From there you can execute the program PCAN-View.

A dialog for the selection of the CAN hardware as well as the setting of the CAN parameters appears after the program start.

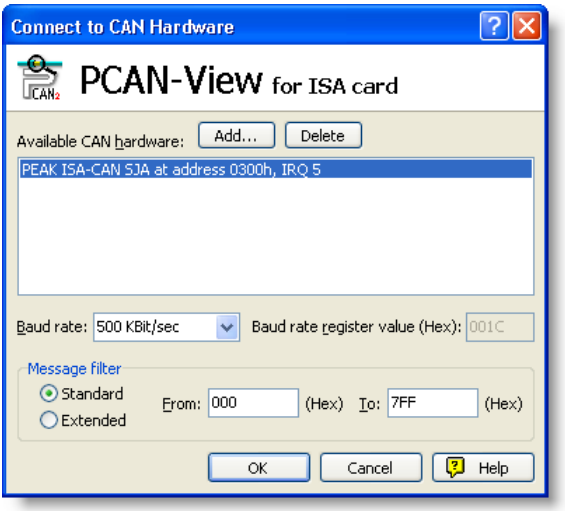

Figure 7: Selection of the CAN specific parameters

If **no entry** is in the list "Available CAN hardware" (for example at the first program start), you need to add one:

1. Press the button **Add**. The dialog box "Add CAN hardware" appears.
2. Select the connected hardware and the operating mode from the list "Type of CAN hardware".

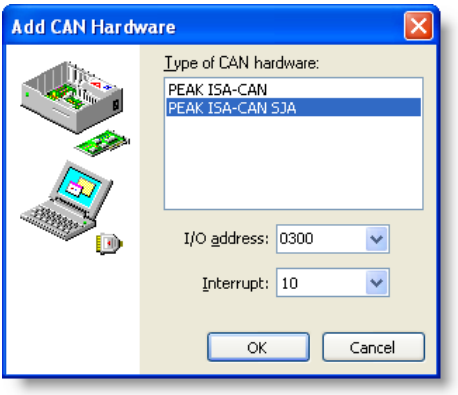

Figure 8: Selection of hardware resources

3. Enter the I/O base address and the interrupt set on the PCAN-ISA card (see section 2.1 *Configuring the PCAN-ISA Card* on page 7).
4. Confirm your input with **OK**.

In the dialog box “Connect to CAN hardware” you may make **further settings** (baud rate and CAN message filter) for the created hardware entry.

If you need further help after the program start, use the online help provided with the program (F1 key).

4.2 Linking Own Programs with PCAN-Light

On the supplied CD-ROM you can find files that are provided for software development. You can access them with the navigation program (button **Programming**). The files exclusively serve the linking of own programs to hardware by PEAK-System with the help of the installed device driver under Windows.

Further more the CD-ROM contains header files and examples for creating own applications in conjunction with the PCAN-Light drivers. Please read the detailed documentation of the interface (API) in each header file.

Tip: You can find further information in the file `PCANLight_enu.chm` (Windows Help file) on the CD-ROM.

Notes about the License

Device drivers, the interface DLL, and further files needed for linking are property of the PEAK-System Technik GmbH (PEAK-System) and may be used only in connection with a hardware component purchased from PEAK-System or one of its partners. If a CAN hardware component of third party suppliers should be compatible to one of PEAK-System, then you are not allowed to use or to pass on the driver software of PEAK-System.

PEAK-System assumes no liability and no support for the PCAN-Light driver software and the necessary interface files. If third party suppliers develop software based on the PCAN-Light driver and problems occur during use of this software, please, consult the software provider. To obtain development support, you need to own a PCAN-Developer or PCAN-Evaluation version.

5 Frequently Asked Questions (FAQ)

Question	Answer
Can I use **several PCAN-ISA cards** in the same computer?	Yes. When there's a lack of resources it is possible to share the same interrupt between CAN channels. However, consider that an unique I/O address range is assigned to each CAN channel.

6 Technical Specifications

Connectors	
Computer	ISA bus with 8 MHz clock rate, 16 bit bus width
CAN	D-Sub (m), 9 pins Pin assignment according to CiA recommendation DS 102-1 Opto-decoupled versions: galvanic isolation up to 500 V (separate for each CAN channel)

CAN	
Specification	ISO 11898-2 High-speed CAN (up to 1 MBit/s) 2.0A (standard format) and 2.0B (extended format)
Controller	max. 2 Philips SJA1000T
Transceiver	max. 2 Philips PCA82C251

Supply		
Current consumption	PCAN-ISA Single Channel: PCAN-ISA Dual Channel: PCAN-ISA Single Channel opto-dec.: PCAN-ISA Dual Channel opto-dec.:	max. 150 mA max. 170 mA max. 210 mA max. 270 mA

Environment	
Operating temperature	-40 – +85 °C (-40 – +185 °F)
Temperature for storage and transport	-40 – +125 °C (-40 – +257 °F)
Relative humidity	15 – 90 %, not condensing
EMC	EN 55024:2011-09 EN 55022:2011-12 EC directive 2004/108/EG

Continued on the next page

Measures	
Size	143 x 66 x 13 mm (5 5/8 x 2 5/8 x 1/2 inches)
Weight	PCAN-ISA Single Channel: 39 g PCAN-ISA Dual Channel: 45 g PCAN-ISA Single Channel opto-dec.: 41 g PCAN-ISA Dual Channel opto-dec.: 48 g

Appendix A CE Certificate

PCAN-ISA IPEH-002074/75/76/77 – EC Declaration of Conformity
PEAK-System Technik GmbH

Notes on the CE Symbol CE

The following applies to the "PCAN-ISA" product with the item number(s) IPEH-002074/75/76/77.

EC Directive This product fulfills the requirements of EU EMC Directive 2004/108/EG (Electromagnetic Compatibility) and is designed for the following fields of application as for the CE marking:

Electromagnetic Immunity
DIN EN 55024, publication date 2011-09
Information technology equipment – Immunity characteristics – Limits and methods of measurement (CISPR 24:2010);
German version EN 55024:2010

Electromagnetic Emission
DIN EN 55022, publication date 2011-12
Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement (CISPR 22:2008, modified);
German version EN 55022:2010

Declarations of Conformity In accordance with the above mentioned EU directives, the EC declarations of conformity and the associated documentation are held at the disposal of the competent authorities at the address below:

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E-mail: info@peak-system.com

Signed this 22nd day of October 2013

Appendix B Quick Reference

Default setting at delivery

CAN Channel	IRQ	I/O Address Range	Remark
1	10	300h – 31Fh	
2	5	320h – 33Fh	Only on the Dual Channel version

Hardware Installation / Configuring the Computer

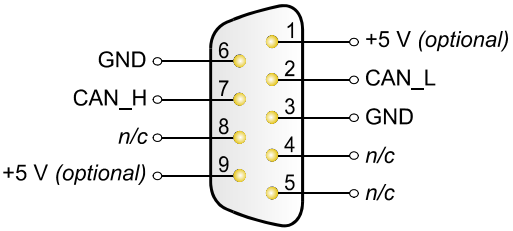
Insert the PCAN-ISA card into a free ISA slot (16 bit) of the switched off computer. After switching on the computer enter the BIOS setup. In the PnP table mark the interrupts used by the PCAN-ISA card as reserved.

Software setup and startup under Windows

Execute the driver installation program from the supplied CD-ROM.

Run the CAN monitor PCAN-View from the Windows Start menu as a sample application for accessing the PCAN-ISA card. Indicate the needed parameters for initialization of the PCAN-ISA card (I/O base address, interrupt) and select the desired CAN channel, when using the Dual Channel version.

HS-CAN connector (D-Sub, 9 pins)



n/c = not connected